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Research Article

Description and comparison of Philippine hornbill (Bucerotidae) vocalizations

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Abstract

The role of vocalisation for the Philippine hornbills' ecology and speciation and their implication in understanding speciation is not well understood. We described and compared recorded calls of seven hornbill taxa in captivity namely Mindanao Wrinkled hornbill (*Rhabdotorrhinus leucocephalus*), Rufous-headed hornbill (*Rhabdotorrhinus waldeni*), Luzon Rufous hornbill (*Buceros hydrocorax hydrocorax*), Samar Rufous hornbill (*Buceros hydrocorax semigaleatus*), Mindanao Rufous hornbill (*Buceros hydrocorax mindanensis*), Mindanao Tarictic hornbill (*Penelopides affinis*), Samar Tarictic hornbill (*Penelopides samarensis*), Visayan Tarictic hornbill (*Penelopides panini*) and Luzon Tarictic hornbill (*Penelopides manillae*), as well as comparison with the non-native Papuan hornbill (*Rhyticeros plicatus*). Vocalisation analysis included call duration, minimum frequency, maximum frequency, bandwidth and peak frequency. For each species in the sample, the mean and standard deviation were used to calculate the Cohen's d statistic by using an effect size calculator. Results showed that the effect size for minimum frequency was small for *P. panini* vs. *P. samarensis* and *B. hydrocorax* vs. *B. h. mindanensis*. However, bandwidth, duration, minimum frequency, maximum frequency and peak frequency have large effect sizes for the rest of the allopatric species pairs. Hornbills' conspicuous resonating calls are sufficiently quantifiable for bioacoustic analysis and may provide new insights for their taxonomic review.

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Keywords

Species limits, hornbills, vocalisation, bioacoustics

Introduction

Hornbills (Bucerotidae) are a charismatic group of tropical birds, under the Order Bucerotiformes, recognised for their long decurved bill supported with a prominent casque. Some 60-64 species of Bucerotiformes are currently recognised worldwide, including two species of ground-hornbills within the family Bucorvidae. The majority of the species belong to the family Bucerotidae and which all share the unique trait of plastering the nest-cavity (Gonzalez 2012). Numerous studies for conservation focused on surveys and other correlated projects which include habitat re-establishment, breeding, instruction for handling and education and public awareness (Lum and Poonswad 2005).

The resounding vocalisations of hornbills aids their communication interaction with conspecifics and sympatrics in dense forest habitats, defence, territory and threat (Haimoff 2008, Poonswad et al. 2013, Policht et al. 2009), but there are few studies on their bioacoustics (Kemp 1998, Gonzalez 2012). However, bioacoustic analysis of the hornbills' calls has remained insufficiently studied despite its potential to provide valuable information to understanding communication and evolution as shown by Oba (1998). It has long been debated on the use of the casque and their implications to the resonating calls produced by hornbills (Kemp 1995, Kinnaird and O'Brien 2007). Tobias et al. (2010) proposed a standardised approach for delimiting of species and establishment of the taxonomic relationships between species and subspecies, based on multiple phenotypic characters i.e. biometrics, plumage and voice.

Studies by Gonzalez (2012) and Gonzalez et al. (2013) show that molecular phylogenetic relationships within Bucerotidae corroborate well with the vocal variations across the family. Currently, the lack of available records of hornbill calls, especially for the Philippine species, impedes further bioacoustic analyses. Therefore, the aim of our study is to record and examine the loud calls of Philippine hornbills kept in captivity in order to describe and compare hornbill vocalisations, based on the standardised criteria parameters given in the standardised criteria for species delimitation.

Material and methods

Study site and recording of vocalisations

Observations took place during the day and the advertisement calls were recorded on an opportunistic basis with a Sony PBR-330 parabolic reflector, Uniso UC-0163 hands-free microphone and Sony IC recorder ICD-BX140. During the recording of the calls, the microphone was approximately 8 to 10 metres away from the hornbill species in captivity. The male hornbills, used in the study, were inside the cages with the other hornbills of the